and appendiceal dyspepsia, and by advising prompt surgical interference. I have no doubt that such refinement of diagnosis is but the question of a short time.

I need but mention the gastric neuroses of various forms reflexly caused by renal lesions, such as movable kidney, lesions of the female pelvic organs, or of the male genito-urinary system, to call to mind a picture of disease difficult at times to diagnosticate, and extremely resistant to any form of treatment, but only indirectly within the province of the surgeon.

It is evident, then, that there are many conditions which directly or reflexly cause the occurrence of what is termed "nervous dyspepsia," and it is my firm belief that, as a rule, the origin of the symptoms can be found in some very definite lesion within or beyond the stomach.

Yet it must be admitted that there are certain cases for which, apparently, the term "nervous dyspepsia" must suffice as a diagnosis. When we have eliminated the possibility or probability of a fundamental lesion, and find a case in which there are the symptoms of dyspepsia, especially one in which the distress occurs only after the ingestion of food, but regardless of its quantity or quality, we may be sure that we have to deal with a true case of gastritis nervosa. The existence of the general symptoms of neurasthenia would make the assurance doubly sure.

What, then, is the attitude of the surgeon toward these cases? I think that it should be "hands off," with but very few exceptions. The surgeon's principal duty, as regards the true neuroses of the stomach, is to recognize them, to separate them from secondary dyspeptic conditions due to lesions which perhaps it is within his province to treat. I regard the proposition to operate on these cases for the mental effect upon their general neurasthenic or hysterical condition as unsafe, illogical, and as setting a most dangerous precedent. It is certainly a confession of weakness in our therapeutics, medicinal and psychic, to suggest such a course.

These cases belong to the internist and neurologist; whether the neurasthenia be primary or secondary to the stomach lesion, our treatment is the same. They are in need of rest, with general and special dietetic treatment. Removal of the primary mental cause is essential, and these patients demand the most careful management if their recovery is to be assured.

There is no exception perhaps to the general statement that gastric neuroses per se are not within the province of the surgeon. If we consider gastric atony and ptosis as really neuroses, when they are apparently primary, they form the exception. There are certain of these cases in which all medical and general treatment is unavailing, while a gastro-enterostomy promptly leads to recovery by furnishing the stomach with drainage, which by its own force it is unable to secure. In ptosis, I have never seen good results from the various methods devised for the purpose of raising the stomach itself. I believe that gastro-enterostomy is the only logical procedure. This is true even in some instances in which the pylorus is entirely patulous. While I believe that an occlusion of the pylorus is the main indication for gastro-enterostomy, I do not think it is the only one.

In conclusion, I cannot do better than to repeat my warning against operative interference in neuroses of the stomach.

THE TREATMENT OF CHRONIC BRONCHITIS.

By F. Forchheimer, M.D.,

PROFESSOR OF MEDICINE IN THE MEDICAL COLLEGE OF OHIO, UNIVERSITY OF CINCINNATI, CINCINNATI, OHIO.

Chronic bronchitis is due to so many causes that its successful treatment is a difficult problem and frequently baffles the most skilful therapeutist. If we are satisfied with treatment of symptoms, as is commonly done and as, of necessity, must frequently be done, a routine therapeutic procedure can easily be prescribed. But this cannot be satisfactory and, as a matter of fact, is not satisfactory. The patients most commonly give up consulting physicians and take such remedies as they choose, namely, some expectorant or opium, and the physician, after having prescribed all the routine remedies, finally tires of efforts which seem futile. It seems supererogatory to state that both causal and symptomatic treatment are necessary for successful treatment of any disease; it may be that the latter includes the former, but both should be applied when possible.

Causal treatment has not received sufficient consideration in chronic bronchitis, which can be explained by the fact that the etiology of chronic bronchitis is very complex and not always discoverable. As indicated by pathological anatomy, there are many forms as well as many stages in this disease; but in all forms there is some change which eventually produces loss of resistance and of elasticity in the elastic and muscular tissue of the bronchi. This may be due to a variety of causes acting upon the mucous membrane from without or from within the body, or upon some inherent weakness of the tissues themselves. For causal treatment the following may be taken into consideration.

1. *Local Causes.* Lesions in the nasopharynx; inhalation of irritating substances, mechanical, chemical, thermic; infections with Bacillus catarrhalis, the pus producers, Bacillus influenzæ, measles, pertussis, tuberculosis, syphilis; diseases of the pleura—pleural adhesions, chronic exudates; diseases of the lungs—asthma emphysema, chronic indurations, tumors, chronic enlargement of the bronchial glands; and malformations of the thorax.

2. *Remote Causes.* Diseases of the heart; diseases of the kidneys; arteriosclerosis; rickets; scrofula, tuberculosis; chronic intoxications (alcohol, gout, auto-intoxications); obesity; heredity; all influences preventing normal respiration; refrigeration (catching cold); and all general causes predisposing to infections.

No case of chronic bronchitis should be treated without considering its cause or causes; but it will be seen from this list that some of these causes act upon the bronchial mucous membrane from within, others from without, some in both ways. In chronic alcoholism the alcohol which is eliminated by the lungs is the chemical irritant which produces the bronchitis. In all those infectious diseases in which the microörganism is carried by the blood current and then localizes itself the production of chronic bronchitis is from within. On the other hand, inhalation of irritating substances is an example of the production of chronic bronchitis from without. In tuberculosis we may have a combination of both modes of infection, as the bacilli may be inhaled, may be developed in the bronchi by extension, by continuity or contiguity, or may be carried by the blood or lymph currents. But whichever way the bronchitis is produced, it is necessary to consider the existence of some form of predisposition. This can easily be demonstrated by observation; the same local cause produces an ordinary acute bronchitis in one subject, in another it is followed by a subacute bronchitis which is the precursor of a chronic bronchitis; or, an acute bronchitis disappears and leaves a local predisposition to infection, or becomes a locus minoris resistentiæ to irritations of any sort, so that eventually a chronic bronchitis develops. Clinically most cases of chronic bronchitis not due to circulatory trouble develop from acute or subacute attacks of bronchitis which recur. The latter are looked upon as "only a cold," and therefore are not considered of sufficient importance to require attention. It is at this stage of the disease that treatment is most important; it may be possible to remove the damage done to the bronchial tubes, or further injury to them may be prevented. In the latter sense we are acting prophylactically, which in this disease is of incalculable value.

Catching cold, which consists of infection plus predisposition, should be prevented. The local predispositions in the nasopharynx should be removed; anything which produces mouth breathing puts in abeyance the filtering functions of the nose, and in its turn makes excessive demands upon the protective functions of the lower sections of the respiratory tract. When there is no mouth breathing, but simply local loss of resistance in the mucous membrane of the nasopharynx, gargling with large quantities of water and cleansing the nose by douching with indifferent solutions twice a day is of the greatest value. For our purpose, it is indifferent how the microbes which produce the "cold" reach the bronchial mucous membrane, whether by continuity of tissue or by the blood route, provided they are removed from the first place of infection. This is effectually done in the way just described, as I have repeatedly seen when it was followed conscientiously. In "catching cold" the general predisposition should also be considered. It is common practice to advise peculiar kind of clothing, dry feet, care in exposure to draughts of air or to changes in temperature. It is very difficult to follow these directions unless the patient considers the prevention of catching cold the principal object of life, and many so consider it. Moreover, if general resistance can be increased the procedure is more natural, more easily followed, and more effective. This is done by the prevention of faulty metabolism and the deterioration of general health. These being attended to, the most important prevention consists in that procedure which has been called Abhärtung by the Germans—hardening. Essentially, this process consists in reducing the reaction of the skin to thermal irritations by gradual education. In doing this we reduce vasomotor reaction in the skin, which is followed by contraction of bloodvessls, and, therefore, we prevent sudden hyperemia in internal organs. Hyperemia upon mucous membranes is one of the principal predisposing causes of infection; this is shown for bronchitis in chronic heart and kidney troubles; acute hyperemia being prevented, the local predisposition is removed. That this is the only way in which the various procedures applied for hardening act may be denied; that the procedure is valuable cannot be doubted. Hardening is accomplished by hydriatic measures, the cold sponge, douche, or plunge; it should be done daily, and it should be modified in accordance with individual indications and limitations.

The infectious nature of "catching cold" should not be forgotten. While we rely upon normal or increased resistance to destroy bacteria, neither of these is present in patients with chronic bronchitis, and it is safer that they be kept away from infection than be exposed to it. It is justly and properly recommended that these patients be kept in the house during rough weather, or that they seek milder climates. Rarely, however, is it advised to prevent infection by not coming into close contact with other people who have a cold. Most people are not able to stay in the house or to leave home for a great length of time, and, after all, when they do the one or the other they are largely preventing infection. When a house epidemic of colds starts, the patient with bronchitic tendencies, who has been left in the house, gets an attack of bronchitis; when an epidemic of colds starts anywhere, in Egypt, Algeria, or Southern California, provided these patients are exposed, the exposure is followed by an attack. All this is thoroughly understood for influenza, and this has done not a little to our understanding of common colds; certainly it is not asking too much to keep predisposed patients away from the possibility of infection.

Auto-infection is more common than is supposed. The bacteria which are found in the nasopharynx are more or less readily disposed of, as has been shown. It is a much more difficult matter when they are retained in the bronchial tubes, producing exacerbations by temporary increase of virulence or diminution of local or general resistance, or simply cause constant irritation by their pressence. The removal of these bacteria when they are in the nose or throat may be easy, as has been described; when they are in the bronchi it is difficult but not impossible.

Bacteria can be removed from the bronchial mucous membrane mechanically, or they may be destroyed. Everything which increases secretion from the mucous membrane removes the surface bacteria; therefore inhalations, medicines, and other measures may be tried. For the destruction of bacteria in bronchitis little has been done. Remedies may be applied directly by intratracheal injections, or indirectly, as such that are eliminated by the bronchial mucous membrane when administered by the mouth or otherwise. Either way is useful, but there is no certainty that bacteria are destroyed; that their number may be diminished is not denied, but from what we have seen this is not sufficient. So that other things, in the way of protective measures, must be found to destroy bacteria, or, at least, to prevent their multiplication. Destruction of bacteria can take place by general means by the introduction of peculiar substances whose properties are well understood (bacteriolysins, bacteriocidins, etc.,), but I do not know that they have ever been applied in the treatment in bronchitis. In a number of cases of streptococcic bronchitis, antistreptococcic serum has been valuable. It is much more to the purpose, at least at present, to destroy bacteria in this stage of the disease by improving local resistance, diminishing local predisposition, or increasing general resistance. A hyperemic mucous membrane has diminished local resistance and increased local predisposition; if the cause or causes are removed this disappears, bacteria cannot grow because their soil is rendered unfavorable and they are actively opposed in their growth. We are accordingly not astonished to find that digitalis has been successfully administered in chronic bronchitis. The thought has not come that it acts by relieving a cardiac cause. "Chronic bronchitis with profuse secretion," says the fifth edition of the U. S. Dispensatory (1904) "is the only inflammatory affection in which it (digitalis) may be advantageously used." As will be observed, it may be advantageously used because the disease is inflammatory, not because chronic myocardial insufficiency is relieved. General causes are of even greater importance in changing the local conditions; chronic intestinal auto-intoxication, gout, and alcoholism should always be considered and excluded. In a certain number of case there is hereditary local predisposition due to some defect of physical or biological qualities in the respiratory apparatus; it is possible to detect this in children and to reckon with it.

The effect of diseased lymphatics upon chronic bronchitis has attracted little attention. There are very few cases of chronic bronchitis in which some change is not found in the bronchial glands, usually a hyperplastic condition clinically marked by enlargement of the posterior cervical glands. The existence of enlarged bronchial glands is easily explained by the direct transportation of the causa irritans to them and its localization within them. The enlargement of the cervical glands because of changes in the bronchial glands not only depends upon the inability of the lymph to be discharged in its proper manner, but the cause of the bronchial enlargement may also be the cause of enlargement of the cervical glands. Hart has shown that in injecting India ink into an animal there is a retrograde transport of this substance from the thoracic duct during inspiration, affecting many glands, but also the bronchial and cervical glands. Whether the bronchial glands be hypertrophied or, as they become later in the disease, atrophic, the effect upon the cervical glands is the same in regard to enlargement except as to degree. Under all circumstances enlargement of bronchial glands produces a distinct effect upon the condition of the lungs and bronchial tubes, which is greater in the mucous membrane of the bronchi than in the lungs, because they are more remote and because the forces causing lymph flow in them are of a more passive nature than in the lungs, especially when they are diseased. The effect produced is that of stasis in the lymphatics, causing a moistening of the whole mucous membrane, a dilatation of lymph spaces and compression of blood-vessels, a copious transudation into the lumen of the tubes, and a condition most favorable to infection. Moreover, functional activity of the protective agencies of the bronchi is diminished, which is followed by the usual results. The treatment of these enlarged glands is frequently followed by excellent results. As a causal indication it should always be considered.

As in all diseases produced by microbes, reduced general resistance is followed by reduced local resistance. It will be seen, then, that reduction of general nutrition, reduction of nerve tone, and anemia act as predisposing factors whose removal by proper treatment is invaluable not only in the first stage of the disease, but also when it has become thoroughly established.

Climatic treatment acts in various ways. There can be no doubt that external temperature is of importance; a patient whose exacerbations come with cold weather may escape them provided he goes to a warm climate. But is it overlooking the mark if this is the only factor taken into consideration in advising change of climate. Send this same patient to a warm or hot climate in a place in which he is constantly forced to breathe dust-laden air, and the result will be far from favorable. Again, the latter or the former may be absent, and yet a change in climate will do no good. Change of climate acts causatively as well as symptomatically, which should always be considered when it is recommended. The way in which change of climate acts beneficially is not so easily explained as would seem on first thought; besides those already mentioned, moisture and altitude must also be considered, and it follows that recommendation of a proper place for an individual is very difficult. Moreover, in recommending change of climate we are not only guided by the disease, but also by the adaptability of the patient to such a change or to any change.

In a certain number of cases the chronicity of the disease is evident from the beginning, but in the greater number it begins as a "winter cough," which gets worse from year to year and lasts longer and longer. In these cases of recurring bronchitis prophylactic treatment is of the greatest value and usually neglected. The attacks should be treated as carefully as possible, the patient should be kept in the house, in bed when there is fever, proper medication prescribed, and his general health considered. In many individuals these attacks are followed by reduction in weight and strength, so that convalescence is slow and predisposition to infection increases. It is in such patients that superalimentation is necessary; many of them do well on codliver oil. Sometimes these attacks are provoked by dust inhalation, especially in cities, and I have known several patients ward them off by wearing respiratory masks. As a rule, this is impracticable, but those in whom this etiology is established, whose occupation causes inhalation of irritating substances, and in those who cannot leave home it should be encouraged. The best preventive is permanent change of climate; next comes temporary change during the season when the bronchial attacks occur. When the irritant can be removed, as is the case in smokers who inhale the smoke, much can be expected for prevention of recurrence.

For one reason or another our patient has gone into the next stage of the disease, in which he is never entirely free of his bronchitis and in addition has exacerbations. He now has pathological changes in the bronchi which are permanent and progressive unless something can be done for him. It matters not what form of chronic bronchitis is considered, the hypertrophic or the atrophic, the inevitable final result is destruction of muscular and elastic tissue. In the hypertrophic form there is great cellular infiltration, which at first prevents normal muscular and elastic functional activity and finally destroys it. In the atrophic form there is substitution of fibrous tissue for the normal in mucosa and submucosa. In all the forms there is change in the mucous membrane: in its epithelial layer from incomplete to complete loss of cells to metaplasia, and in the lower layer infiltrative or atrophic changes. There is much congestion of the bloodvessels. Sooner or later all the tissues are changed, including cartilage, by infiltration and final atrophy. All these changes are followed by change of functional activity. In the epithelium the protective power of the ciliated cells is lost, small foreign bodies as well as particles of mucous cannot be removed. In the elastic and muscular tissues the function of motion is interfered with or destroyed, and the material which collects upon the mucous membrane is not removed and remains as a constant irritant to produce renewed irritation and inflammation. The changes in the deeper layers cause weakening and loss of resistance to pressure which are followed by dilatation of the bronchial tubes. Not only do the bronchial tubes dilate because of expiratory efforts, such as coughing, but ordinary inspiration may at times be followed by dilatation. Because of the effect of diminished respiration, which occurs in chronic bronchitis, as well as destruction of bloodvessels, changes in the heart, especially hypertrophy of the right ventricle, occur.

As failure of removal of secretion is then so important, it is no wonder that this removal has been looked upon as the principal object of therapy. It is true that the usual ratiocination is not the one I have just applied, but is as follows: Secretion into the bronchial tubes produces coughing, the more secretion the more cough, the more cough the more annoyance, therefore, the secretion should be removed or the cough be checked. Those medicaments called expectorants have been employed for this purpose. They are directed to increasing fluidification of the expectoration, to irritation, so that increased efforts are made to propulsion, and to causing the secretion to be dried up. In chronic bronchitis it is rarely necessary to employ the second kind of expectorant, to which belong musk, ether, camphor, ammonium carbonate, alcohol, and others; certainly routine use of any of these drugs is contra-indicated.

In the first class there are nearly all the alkalies—ipecac, apomorphine, ammonium chloride, and pilocarpine. In the third group there are turpentine, benzoic acid, and creosote, their preparations and derivatives, copaiba, myrtol, eucalyptol, tar, and the astringents, such as lead or tannic acid, and belladonna and its preparations. The iodides are also valuable as expectorants, since they liquify the expectoration; but as they are eliminated by the bronchial mucous membrane and irritate it, they should be cautiously administered in chronic bronchitis. Beyond the general indications it is impossible to decide between the various members of each group, except by considering the possibility of unfavorable activity. In the bronchitis of Bright's disease we should be very careful to give only such remedies as do not irritate the kidneys. Aside from these considerations, our preferences are determined by actual experience: of the first group I use chloride of ammonium, ipecac, the alkalies, and pilocarpine; of the second class of expectorants, camphor and carbonate or anisate of ammonium; and of the other group I prefer turpentine, the benzoates, creosote and its preparations or derivatives, eucalpytol, and tar.

The same effects follow inhalation as are produced by medicines. There is some doubt of their modus operandi, but there is no doubt of their efficacy. In order that they attain their maximum efficiency the fluid used should be as finely subdivided, vaporized, as possible, and its temperature not too far from the internal temperature of the body. The apparatus are of variable construction—inhaling masks, so called atomizers or nebulizers, inhalation cabinets or chambers. The choice depends more upon the kind of patient than upon the nature of the case. I have obtained excellent results by using two layers of a frequently washed old woollen petticoat as an inhaling apparatus, but manifestly that would not do if the petticoats are neither old nor of wool. By using the old fashioned croup kettle an inhalation chamber may be improvised. For the purpose of fluidifying the expectoration, inhalation of aqueous vapor of sodium bicarbonate or of Ems water; for diminishing the expectoration, turpentine, tar, creosote, eucalyptus, menthol, and tannic acid, can be recommended, applied in the same manner.

Intratracheal injections seem to be followed by good results. The fluid is injected into the trachea by means of a peculiarly constructed syringe; but to do this requires training. The following substances, dissolved in olive oil, have been applied in this manner: menthol, carbolic acid, guaiacol, iodoform, morphine. From what I have seen, this mode of treatment has been beneficial, but only for relief of symptoms, and this can be effected by simpler means in uncomplicated cases of chronic bronchitis, so that, at least in this form, it is not necessary except in advanced cases.

In ordinary cases postural treatment is the best for the removal of secretion from the bronchial tubes. In a normal bronchial tube the secretion is removed during the night by the ciliated cells; when secretion is increased this is no longer possible, and the patient must remove it by coughing—always in the morning, frequently at night as well. The secretion collects and calls the protective function of coughing into action. Because of our position in bed during sleep the bronchial secretion either remains stationary, when the body is level, or, when the head is higher than the trunk, gravity forces it away from the larynx; in either case collection of secretion takes place. If we change these positions so that the head is lower than the trunk, bronchial secretion neither stagnates nor does it move in the wrong direction, as the combined effect of ciliatic motion and gravity is sufficient to remove comparatively large quantities of secretion. This is accomplished when the patient sleeps with the foot of the bed elevated; in most cases this is sufficient; at times, depending upon the side and seat of the lesion, combinations of ventral or lateral posture may be necessary. The foot of the bed may be elevated by putting wooden blocks or bricks under it; whenever it is possible it is advisable to get beds which are so constructed that one end can be elevated. Long experience has taught me that the first elevation should not exceed two inches; later this may be increased to four or five inches. The combined postures are obtained by the use of pillows or bolsters in the inclined bed; as a rule, they are not successfully carried out, but in a number of instances I have obtained good results. Whatever is done must be done gradually. Frequently the patient is unwilling to try a posture which is the opposite of the one he naturally takes to relieve his symptoms (cough, dyspnea). Moreover, it is very difficult for most people to sleep with the head lower than the trunk. When therefore a patient is found who sits up all night so that he can cough more effectually, it will not do to begin immediately with elevating the foot end of the bed. This is true also in dyspnœa and in very nervous people. When these conditions exist, I ask that the patient try with fewer pillows, then the horizontal posture, and finally the elevated one. When this is done there are few failures in the continuance of the treatment. After the patient has tried to carry out directions for a few nights, there is no further difficulty. As soon as the patients can pass the greater part of the night with feet elevated the symptoms begin to disappear. They cough less during the night, therefore sleep better; the morning cough is diminished and the amount of expectoration is lessened or disappears entirely. In a number of instances I have seen what may be called a cure, as all symptoms of the disease disappeared, but relapses occurred after a longer or shorter time, as could have been expected from our etiological conception of chronic bronchitis. This mode of treatment is applicable to all forms of chronic bronchitis in which the removal of expectoration is essential. It therefore is of no value in dry bronchitis. It cannot be expected to be followed by benefit in cases in which gravity does not assist; for instance, when elevation of the feet prevents the emptying of a dilated bronchus, then a combined posture may be of service.

In fœtid bronchitis intratracheal injections of iodoform in oil (0.4 per cent.), or inhalations of carbolic acid, equal parts of carbolic acid, alcohol, and glycerin, of thymol, 0.05 to 0.1 per cent. solution, of a 0.5 to 2.5 per cent. solution of oil of eucalpytus in alcohol and water, are useful. Internally A. Fraenkel recommends capsules each containing myrtol, 0.15 to 0.3 gram (2½ to 5 grains); not more than 1 gram (15 grains) to be given in the course of twenty-four hours. Tar preparations, turpentine, lead acetate, and many other remedies are also recommended to be applied in the same manner.

The treatment of the cough in chronic bronchitis is an especially difficult problem; if we check the cough too much, there may be retention of secretion with all its consequences; if we permit the patient to cough too much, there may follow weakening of the bronchial coats and dilatation of the bronchial tubes. Too much coughing produces more cough, and too little coughing is followed by the same result. In addition, those remedies which reduce the cough reflex with certainty are accompanied by effects not altogether beneficial to the patient. As has been shown, diminution of expectoration is followed by diminution of cough. But in the dry form of chronic bronchitis there is little expectoration, and yet there is cough. When the cough is so annoying as to cause local or general symptoms, something must be done. The milder measures should first be tried: drinking of warm liquids, equal parts of Ems water and hot milk, frequently acts very well; the Species Pectorales of the National Formulary or some warm alkaline solution may be tried. In practice most patients have some especial form of tea which acts beneficially, but this fails with others, who, in their turn, are beneficially affected by a tea called by some other name but having the same ingredients.

This observation naturally led to the conclusion that excessive coughing results from some nervous mechanism which can be controlled by increased inhibition—let it be called autosuggestion. When the patient can be taught to inhibit the reflex which produces the cough, we possess an invaluable way of checking the cough and one which succeeds frequently. Most patients of average intelligence and fortitude can be taught to resist constant coughing; in some the autosuggestion must be reënforced by the administration of some drug which can be taken frequently without doing harm, in the form of a tablet, a lozenge, or a cough drop, containing horehound, althea, licorice, flaxseed, Iceland moss. In some instances hydrotherapy is valuable, the Preissnitz application around the throat or enveloping the whole chest. But there will be failures with any or all of the measures recommended, and then recourse must be had to remedies which reduce the cough reflex; the bromides and chloral are sometimes valuable, but commonly we must resort to codeine, heroin, or morphine. In a chronic disease the prevention of a drug habit is of the utmost importance; although a codeine habit does occasionally occur, it is very rare and easily relieved; therefore this drug should be administered first. If it does not give relief, heroin should be tried in small doses (0.004 to 0.008 gram; $\frac{1}{16}$ to $\frac{1}{8}$ grain); as Harnack first pointed out, it is more toxic than morphine, and heroinism (morphinism) does occur. Last of all, opium or morphine should be administered, preferably opium. There are very few cough mixtures which do not contain the one or the other.

The treatment by mineral waters is supposed to affect the expectoration, and this is probably the case when they contain alkalies or sulphur. But this indication is not the only one to be followed in sending patients to springs; frequently it is the removal of the cause which helps, or a combination of activities such as we always see following courses of treatment at springs. It is therefore difficult to be precise in indicating where the individual should be sent. Alkaline-saline and saline waters might be expected to loosen expectoration, therefore patients may be sent to Ems, Soden, Kissingen, Homburg, Carlsbad, and Marienbad for this purpose, in addition to the general ones just referred to. Sulphur waters may be expected to have more or less effect in the direction of drying up the expectoration, but they are much more valuable for general treatment. In this country we find them in the White, Red, and Salt Sulphur Springs of Virginia, Richfield, Sharon, and many others. Abroad, Harrogate, Aix-les-Bains, Cauterets, Eaux-Bonnes, and Barèges are recommended.

The character of the expectoration also largely determines the choice of climate for chronic bronchitis. To reduce expectoration dry climates should be selected; to increase it moist places should be chosen. The dry forms are best treated in Algiers, Corsica, Cannes, Nizza, Mentone abroad; in this country the coast of Florida and Southern California are of great service. In cases with moderate secretion the interior of North or South Carolina, Georgia, or Florida may be chosen. In the very moist forms the desert in Egypt or Algiers is highly recommended; in this country Montana, Wyoming, Colorado, northern New Mexico, western Kansas, southern New Mexico, and southern Arizona. Everything else being equal, we may expect complete cessation of expectoration by removal to the proper climate, therefore change from a progressive to a stationary condition and perhaps in some instances complete cure. The details for choice of climate are the same as in any other disease, and in addition to control of expectoration it should be modified by considerations in other directions, as in any other disease in a given individual.

The treatment directed with expectoration and cough as a guide not only gives relief, but prevents further development of anatomical lesions. If in addition to this we could remove the anatomical lesions produced by the chronic bronchitis and return the tissues to their normal condition we could control the whole situation. This is not possible, but something can be done. In this connection it is necessary to consider the administration of iodine and its compounds, the action of which in the human body is not thoroughly understood, but the effects of which are thoroughly appreciated by clinicians. As a result of clinical observations we have taken for granted that the administration of iodine is followed by distinct effects upon glandular structures, as well as upon some of the consequences of inflammation. The former action, I believe, has not been assailed; it is certain that in so far as the lesion of chronic bronchitis is confined to glandular hypertrophy and infiltration, the disease may be cured by the consistent administration of iodine. In some degree the changes in the bronchial wall resemble those of arteriosclerosis, as there is destruction of elastic and muscular tissue and substitution of fibrous tissue for them. We may look upon the therapeutic problem as possessing the same terms; we try to reduce connective tissue and increase elasticity and muscularity of the bronchial walls. That this follows the proper administration of iodine in arteriosclerosis as well as in chronic bronchitis is certain. How it occurs is not proved. Müller and Inada, working with Romberg (1904), showed that potassium iodide reduces the viscosity of the blood. Aside from the fact that this would not explain most of the changes following the administration of iodine, Determann, working with more accurate methods, failed to verify this observation. Rumpf states that iodine does not act by causing absorption, and as this view is in direct opposition to all our experience, more evidence than a mere statement should be adduced until it can be entertained. It is true there is little experimental evidence one way or the other, although Scharz (1908) has shown that by pencilling the edges of aseptic wounds with iodine very small cicatrices are left; in other words, iodine causes absorption of newly formed connective tissue. But absorption follows the use of iodine in various conditions of connective tissue formation (non-syphilitic), in brain tumors, in inflammatory results in the eyes, the ears, the joints, indeed—wherever fibrous tissue is found adventitiously. How this is done is not understood, but the fact that Huchard's views of dilatation of bloodvessels by iodides are being reëstablished, with the peculiar vascular conditions existing in newly formed connective tissue, increased blood supply might account for absorption of tissue, which impedes activity of elastic and muscular tissue in the bronchial wall merely by its presence. That the iodides act only by causing increased expectoration in chronic bronchitis is refuted by the observation that they are of great value when the expectoration is already increased. But in order to get good effects from iodine it should be given as we give it in arteriosclerosis, for a long time, from one to two years, the dosage to be controlled by the physiological effects. Any preparation of iodine may be given, and the choice frequently depends upon the so-called idiosyncrasies of the patient. Whenever it is possible the iodides should be given in chronic bronchitis, as they are followed by better results than pure iodine.

Much may be accomplished by drugs, as has been stated. Equally as much may be attained in the same direction by the proper employment of exercises and gymnastics. In order to do this we should bear in mind precisely what we wish to accomplish and then try to formulate directions which will help us to gain the desired results. For chronic bronchitis, before great structural changes have taken place these results have already been described. The formula for producing these effects is a very simple one—increase expiration. In increasing expiration the lungs and bronchi are contracted. For our present purposes circulation is changed at this time, for during expiration blood pressure is increased, and, as Kronecker and Heinricius have shown, a greater amount of blood flows to the right heart during expiration. With increased circulation stasis is removed, and with it many of the pathological conditions of chronic bronchitis. Contraction of the bronchi during expiration favors expectoration, as accumulated secretion in glands is pressed out of the mucous membrane into the lumen of the bronchi and is followed by an increased cough reflex. Nutrition of the various coats depends largely upon contraction of the bronchi; the veins are depleted and the lymphatics are emptied. When expiration is increased, the normal effects of it are increased; moreover, certain new effects are produced in pathological states which are valuable for therapeutic purposes. There is a distinct effect tending to diminish glandular and cellular infiltration, probably also existing connective tissue. Exercise of involuntary bronchial muscle takes place with the same results that follow this procedure in the myocardium. When the organic changes existing have been diminished the possibility of regeneration of elastic tissue must be taken into consideration. This occurs much more frequently than is conceded, a fact confirmed by Jores' statement that all fibroblasts can produce elastic tissue.

How can all this be accomplished? Knopf has called attention to the fact that many people do not understand how to breathe properly or they breathe paradoxically, that is, the upper part of the thorax expands while the lower part does not, because the abdominal muscles contract during inspiration. The importance of removing this form of breathing by education immediately suggests itself for chronic bronchitis, and much stress is laid upon it by Knopf in this connection. It is very easy to teach patients to increase expiration, and the quantity of increase may be increased or diminished. The simplest form is to ask the patient to take full inspirations, which should be followed by full expirations. In doing all of these respiratory gymnastics the patient should breathe fresh air, always breathe in through the nose and breathe out through the mouth, for as the chink of the glottis is normally diminished during expiration, less resistance follows mouth than nose expiration. More effect than is produced by simple inspiration and expiration follows elevation of the arms during inspiration followed by expiration with the arms at the side. There is added flexion of the lower extremities with expiration. In order to produce still greater effects upon expiration, the lower part of the thorax should be compressed manually during each expiration in combination with one of the first movements. The latter, that is, compression of the thorax, which was first introduced by Gerhardt, is very valuable in helping expectoration. These movements should not be done more rapidly than the normal respiratory rate, 18 times per minute. Exercise of the abdominal muscles by voluntary contraction may also be tried, and in some instances it is very valuable. Passive movements by massage, electricity, or by the aid of apparatus may be valuable in individuals, as much by the mental as the physical effects which follow them.

It is impossible to discuss the theoretical and practical aspects of pneumatic apparatus within the limits of this article. Since their reintroduction about thirty-five years ago a large literature has developed, which comprises all possible refinements of thought, reason, ingenuity, and, at times, credulity. It may be freely stated that pneumatotherapy is still used extensively; furthermore, that good results sometimes follow its application. My own experience leads me to believe that the practitioner does very well without it, an opinion which seems verified by the disappearance of pneumatic apparatus from the offices of physicians.

OPEN-AIR AND HYPEREMIC TREATMENT AS POWERFUL AIDS IN THE MANAGEMENT OF COMPLICATED SURGICAL TUBERCULOSIS IN ADULTS.[1]

By Willy Meyer, M.D.,
PROFESSOR OF SURGERY IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; ATTENDING SURGEON TO THE GERMAN HOSPITAL; CONSULTING SURGEON TO THE NEW YORK SKIN AND CANCER HOSPITAL AND THE NEW YORK INFIRMARY.

There are some localities in the body in which bone tuberculosis, though operable, cannot be cured by operation alone. Tuberculous affection of the os sacrum is one type of this class of cases; that of the pelvis, such as acetabulitis complicated with suppurating coxitis, another. The persistent sinuses following excision of the hip-joint often baffle the surgeon's skill and patience.

Cold abscess formation as a result of tuberculosis of the pelvis, especially if recurring again and again, is always a grave complication, and particularly so in adults. It is true, much can be accomplished nowadays by filling the cold abscess cavity, after evacuation of the pus through a trocar, with iodoform emulsion (best iodoform suspended in sterilized glycerin), and following this process by the faithful and persistent use of hyperemia for the diseased bone or joint. Still, there are cases that resist all our efforts in this direction. It is in these cases that additional open-air treatment may become the means of saving limb or life.

The literature in this respect, at least in so far as the treatment of older patients is concerned, is rather meagre. Halstead, of Baltimore, in 1905, read a paper at the first annual meeting of the International Association for the Study and Prevention of Tuberculosis, on the Results of the Open-air Treatment of Surgical Tuberculosis, in which he set forth the beneficial influence of fresh-air treatment in tuberculous bone affections, and gave his personal experience with the method. What has been accomplished in the young with this method is well-known. The reports issued by the various seaside resorts abroad, as also the Sea-breeze Hospital in Coney Island, maintained by the New York Association for Improving the Condition of the Poor,[2] furnish ample proof in this direction.

---

[1] Read at a meeting of the Section on Surgery and Orthopedics of the International Congress on Tuberculosis, Washington, D. C., October, 1908.

The following three cases selected from a number that have come under my care within the last few years will serve to illustrate the point in question.

CASE I.—*Tuberculosis of the os sacrum, involving both ilio-sacral joints and the fifth lumbar vertebra with its articulation.*

Mr. X. Y., aged forty years, who had suffered from repeated slight attacks of hemorrhage from the lungs during the last few years, came under my care in April, 1906, on account of a cold abscess over the left iliosacral joint. The os sacrum was swollen and tender in its upper part, as was also the neighboring pelvic bone. In view of the patient's reduced general condition, more serious operative intervention could not be considered at the time. The abscess was evacuated under local ethyl-chloride-cocaine anesthesia and then filled with a 5 per cent. emulsion of sterilized iodoform-glycerin. There was little reaction. The patient was put on a nourishing diet and remained under the care of a nurse. Three weeks later, and again four weeks thereafter, the procedure had to be repeated, as the abscess had refilled. Soon afterward a discharging sinus formed. As the patient had large business interests at stake, and time was an important item, excision of the iliosacral articulation was seriously considered. However, increasing swelling and tenderness of the right (opposite) iliosacral articulation rendered operative work out of question. There could be no doubt that the entire upper part of the os sacrum was involved in the disease.

In former times, such a patient was usually doomed. Today we have learned that conservative methods of treatment may yet at times accomplish a cure in these cases. Fortunately, the patient belonged to that class that need not count the cost in trying to regain health. Accompanied by a nurse, he was sent to the mountains, where he was so fortunate as to come under the care of a most thorough and learned colleague. He was kept on his back, lived in the open day and night, was put upon a forced diet, and had general massage and proper internal medication. A typical tuberculous affection of the sheath of the left Achilles tendon, which had developed within a comparatively short time, was regularly subjected to hyperemic treatment with the elastic bandage around the thigh.

After four months he had gained almost forty pounds, and had to change his diet in order to reduce his weight. The neighborhood of the sinus was tender, as before, and the opposite sacro-iliac articulation. Now hyperemic treatment by means of suction glasses was added. Regularly every day a large oval glass globe, covering the upper part of the os sacrum and both sacro-iliac articulations, including the

---

[2] Medical Record, March 7, 1908.